

Focusing of ion beams by means of tapered glass capillary optics

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We present evidence of the focusing effects of fine glass capillary optics for H^+ ion beams. In this article we describe the fabrication method and the results of performance test of such tapered glass capillaries, and indicate that a very strong focusing effect does exist. The glass capillary optics is formed by a puller as to have inlet diameters of about 3 mm and outlet diameters of submicrons. The total length of the optics is about 80 mm. Impinging 240 keV protons to such optics are reflected by the inner wall several times, in a very similar process to the so-called surface channeling. The tapered angle is designed to be less than the critical angle of channeling so that the ion beam can penetrate the inner space just like channeled ions in single crystals. Compared with the conventional micro-ion beam facilities, the present method is certainly simple and low cost, thus providing an easy method of submicron Rutherford backscattering spectrometry or particle induced x-ray emission analyses [1]. In addition, if the ion species are extended to heavier elements, the present method provides versatile maskless ion implantation techniques.

References

- [1] Soejima H. and Narusawa T., Adv. X-Ray Anal. 2002;44:320.